REMARKS

This amendment is responsive to the Final Office Action dated February 23, 2006. Applicant has amended claims 1-3, 5-7, 9, 12-13, 17, 22-25, 28-30, 32-37, 39-41 and 43, and cancelled claim 38. Claims 1-37 and 39-44 are pending.

As a preliminary comment, Applicant would like to thank the Examiner for discussing the Final Office Action via telephonic interview on March 21, 2006. The undersigned and Examiner Shaw participated in the interview. During the telephonic interview, the Applicant and the Examiner discussed the invention in general and the claims in view of the cited reference. In particular, the Examiner allowed the Applicant to explain the general nature of the invention. No agreement was reached between the Applicant and Examiner Shaw with respect to the cited reference.

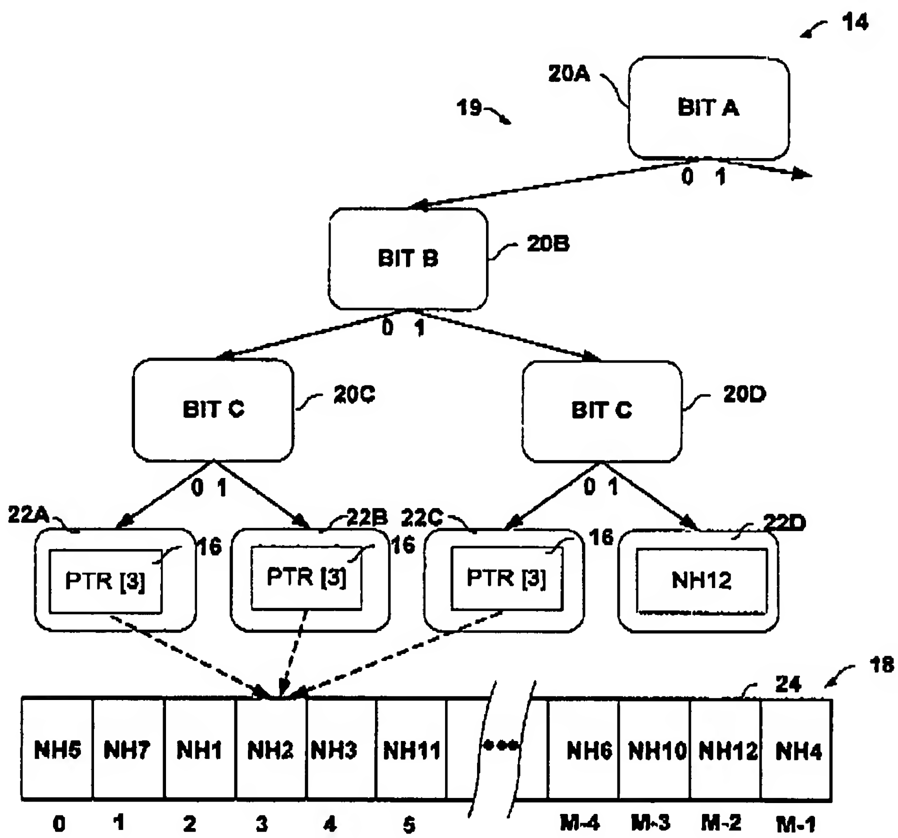
Claim Rejections Under 35 U.S.C. §§ 102, 103

In the Office Action, the Examiner rejected claims 1, 6-9, 11, 17, 20-21, 24-28, 31-34, 36-38 and 41-44 under 35 U.S.C. § 102(e) as being anticipated by Cain (USPN 6,857,026); and rejected claims 2-5, 18-19, 22-23, 29-30 and 39-40 under 35 U.S.C. § 103(a) as being unpatentable over Cain in view of Aramaki et al. (USPN 6,618,760) (hereafter Aramaki).

Applicant traverses all of these rejections. Cain fails to disclose each and every feature of the claimed invention, and provides no teaching that would have suggested the desirability of modification to include such features. Furthermore, Aramaki provides no teaching that remedies the clear deficiencies of Cain relative to the features recited in Applicant's claims.

Applicant has amended the claims to clarify certain elements. For example, Applicant has amended claim 1 to require storing, within a network router, *a forwarding tree* having a set of nodes, wherein the nodes include leaf nodes that correspond to destinations within a computer network. Amended claim 1 now recites storing, *external to the forwarding tree,* next hop data representing network devices neighboring the network router. Claim 1 also requires storing, *within the leaf nodes of the forwarding tree*, indirect next hop data that map the leaf nodes of the forwarding tree to the next hop data, *wherein at least two different ones of the leaf nodes of the forwarding tree contain indirect next hop data that references the next hop data for the same neighboring network device.*

With respect to this claimed embodiment, Applicant refers the Examiner to FIG. 2A of the present application, reproduced below:



As discussed with the Examiner during the telephonic interview, FIG. 2A shows one embodiment of a radix tree having a set of nodes, including leaf nodes 22A-22D, arranged as a tree. As shown, leaf nodes 22A, 22B and 22C of radix tree 19 form the bottom row of the tree, and include indirect next hop data 16 that references next hop data 18 *external to the forwarding tree*, thereby mapping each leaf not to a corresponding next hop for a respective network destination represented by the leaf node. In this manner, leaf nodes 22A, 22B and 22C of radix tree 19 do <u>not</u> contain next hop information, but include references to next hop data 18 that is stored *in a separate data structure external to radix tree 19.* In this fashion, indirect next hop data 16 provides intermediate data structures that relate leaf nodes of the forwarding tree to

external next hop data 18. In an alternative embodiment, array 24 may store references to specific interface ports, processing modules, or both.

FIG. 2A also shows an embodiment in which *at least different ones of two of the leaf nodes* (i.e, leaf nodes 22A, 22B and 22C in this example) of the radix tree 19 contain indirect next hop data 16 that references the next hop data (NH2) for the *same* neighboring network device. That is leaf nodes 22A, 22B and 22C include indirect next hop data 16 pointing to the *same* next hop (NH2) stored external to radix tree 19.

In the Office Action, the Examiner analyzed independent claim 1 in detail. The Examiner indicated that independent claims 17, 24, 28 and 37 were rejected based on the same rationale set forth with respect to claim 1. Cain, however fails to disclose several features of Applicant's claims.

As one example, Cain fails to disclose or suggest storing, *external to the forwarding tree*, next hop data representing network devices neighboring the a network router, as required by claim 1. As discussed in further detail below, Cain does not refer to use of a forwarding tree at all.

Second, Cain fails to disclose or suggest storing, *within the leaf nodes of the forwarding tree*, indirect next hop data that map the leaf nodes of the forwarding tree to the next hop data,. Cain makes no suggestion of a forwarding tree modified in a manner where the leaf nodes store data the maps the respective leaf nodes to next hop data stored external to the forwarding tree.

Third, Cain makes no suggestion that *at least different ones of two of the leaf nodes* of the forwarding tree contain indirect next hop data that references the next hop data for the *same* neighboring network device. An example of this claim element is shown in FIG. 2A of the present application (reproduced above) with respect to indirect next hop data 16 of leaf nodes 22A, 22B and 22C pointing to the same next hop (NH2) stored external to radix tree 19.

In the Office Action, the Examiner cited column 3, lines 50-63 and column 4, lines 12-19 and lines 42-56 of Cain. The Examiner rejected claim 1 based on these passages of Cain.

The three passages of Cain cited by the Examiner in the rejection of claim 1 are copied below in their respective entireties. The passage at column 3, lines 50-63 of Cain indicates:

> Because the routing table includes multiple routes for the destination, the node needs to select a route from among the routes in the routing table. Essentially, the node needs to find in the routing table the highest priority route that is available for routing protocol messages to the destination. Thus, the node must differentiate between routes having different priorities, and may need to determine whether particular routes are available or unavailable.
>
> When prioritizing routes or selecting a route from among the routes in the routing table, it is preferably for the node to ensure that any route used for routing protocol messages does not create a forwarding loop. The node typically uses a routing algorithm to verify that a particular route does not create a forwarding loop.

This passage of Cain describes nothing more than selection of a route from a routing table, and indicates that preferably, a route should be used that does not create a forwarding loop. This passage fails to disclose or suggest any form of "indirect next hop data" that maps leaf nodes of a forwarding tree to next hop data stored external to the forwarding tree, as required by claim 1. Nothing in this passage describes or suggests a forwarding tree or next hop data separate from the forwarding tree. Nothing in this passage teaches or suggest any form of indirect next hop data within the leaf nodes whatsoever, let alone indirect next hop data that maps those leaf nodes to the next hop data external to the forwarding tree.

The next passage of Cain cited by the Examiner, column 4, lines 12-19, provides that:

> Each node determines various routes to the other nodes in the communication network, assigns a relative priority to each route, and installs at least a preferred route and an alternate route in its routing table. For example, Node A (102) may determine that there are four (4) possible routes to Node D (108), namely routes ABD, ACD, ABCD, and ACBD, by running multiple routing protocols, by computing multiple routes, through manual configuration of routes, or by some other means. Node A (102) then assigns a relative

This passage of Cain describes how multiple routes can be defined between nodes within a network, and how a preferred route and an alternative route can be installed. Neither of the

preferred route or the alternative route, however, makes use of indirect next hop data that maps leaf nodes of a forwarding tree to next hop data stored external to the forwarding tree, as required by claim 1. Nothing in this passage describes or suggests a forwarding tree or next hop data separate from the forwarding tree. Nothing in this passage teaches or suggest any form of indirect next hop data within the leaf nodes at all, let alone indirect next hop data that maps those leaf nodes to the separate next hop data.

The final passage of Cain cited by the Examiner in the analysis of claim 1, column 4, lines 42-56, provides:

> It is beneficial, then, to prioritize the routes such that the preferred route and the alternate route are associated with different next-hop devices and are supported over different network interfaces. It may be insufficient to prioritize the routes such that the preferred route and the alternate route are associated with different next-hop devices but are supported over the same network interface (for example, via a point-to-multipoint communication link). Likewise, it may be insufficient to prioritize the routes such that the preferred route and the alternate route are associated with the same next-hop device but are supported over different network interfaces (for example, via separate communication links). The selection of a robust alternate route is particularly important when only two routes (i.e., a preferred route and an alternate route) are installed in the routing table.

This passage of Cain, like the passage at column 4, lines 12-19, discusses preferred and alternative routes. In particular, this passage describes associating the preferred route and alternative routes with different next-hop devices. However, there is no indication in Cain that either the preferred route or the alternative route make use of any form of "indirect next hop data" that maps leaf nodes of a forwarding tree to next hop data stored external to the forwarding tree, as required by claim 1. Nothing in this passage describes or suggests a forwarding tree or next hop data separate from that forwarding tree. Nothing in this passage teaches or suggests any form of indirect next hop data stored within the leaf nodes at all, let alone indirect next hop data that maps those leaf nodes to the separate next hop data.

For at least these reasons, Cain fails to disclose each and every limitation set forth in Applicant's independent claims. Therefore, the rejections under 35 U.S.C. § 102(b) are improper and must be withdrawn.[1]

Furthermore, the rejections under 35 U.S.C. § 103 are also deficient for the same reason. To be sure, Aramaki provides no teaching that remedies the deficiencies of Cain relative to the features recited in Applicant's claims. Aramaki appears to describe a packet forwarding scheme that uses sets of routing tables to represent entries of a radix tree. Nothing in Aramaki, however, discloses or suggests make use of any form of "indirect next hop data" that maps *leaf nodes* of a forwarding tree to next hop data stored *external* to the forwarding tree, as required by claim 1. Nothing in this Aramaki describes or suggests a forwarding tree or next hop data separate from that forwarding tree. Nothing in Aramaki teaches or suggests any form of *indirect next hop data stored within the leaf nodes, let alone indirect next hop data that maps those leaf nodes to the separate next hop data*. Consequently, Cain in view of Aramaki fails to establish a prima facie case for non-patentability of Applicant's claim 1 under 103(a).

With respect to amended independent claim 17, Cain in view of Aramaki fails to teach or suggest a router comprising a computer-readable medium to store next hop data, external to the forwarding tree, representing neighboring network devices, and indirect next hop data, within the

[1] *See Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 USPQ 81 (CAFC 1986) ("it is axiomatic that for prior art to anticipate under 102 it has to meet every element of the claimed invention"). *See also Lewmar Marine, Inc. v. Barient, Inc.* 827 F.2d 744, 3 USPQ2d 1766 (CAFC 1987); *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (CAFC 1990); *C.R. Bard, Inc. v. MP Systems, Inc.*, 157 F.3d 1340, 48 USPQ2d 1225 (CAFC 1998); *Oney v. Ratliff*, 182 F.3d 893, 51 USPQ2d 1697 (CAFC 1999); *Apple Computer, Inc. v. Articulate Systems, Inc.*, 234 F.3d 14, 57 USPQ2d 1057 (CAFC 2000).

leaf nodes of the forwarding tree, that maps the leaf nodes of the forwarding tree to the next hop data. In addition, Cain in view of Aramaki fails to teach or suggest *a control unit that, upon reaching a leaf node of the traversed path, uses the indirect next hop data within the leaf node of the traversed path to select a next hop from the next hop data external to the forwarding tree.*

With respect to amended independent claim 24, Cain in view of Aramaki fails to teach or suggest a packet forwarding engine to store next hop data *external to the forwarding tree*, representing interfaces to neighboring network devices, and indirect next hop data, *within the leaf nodes of the forwarding tree*, that *maps the leaf nodes of the forwarding tree to the next hop data.*

With respect to amended independent claim 28, Cain in view of Aramaki fails to teach or suggest a computer-readable medium having instructions that cause a processor within a router to store, *external to the forwarding tree*, next hop data representing network devices neighboring the a network router; and store, *within the leaf nodes of the forwarding tree*, indirect next hop data that map the leaf nodes of the forwarding tree to the next hop data, *wherein at least two of the leaf nodes of the forwarding tree contain indirect next hop data that references the next hop data for the same neighboring network device*. Cain in view of Aramaki also fails to teach or suggest a computer-readable medium having instructions that cause the processor to, *upon reaching a leaf node of the traversed path, use the indirect next hop data within the leaf node of a traversed path to select a next hop from the next hop data external to the forwarding tree.*

With respect to amended independent claim 37, Cain in view of Aramaki also fails to teach or suggest a method comprising routing packets within a network using indirect next hop data that *maps leaf nodes of a forwarding tree to next hop data stored external to the forwarding tree*. Cain in view of Aramaki also fails to teach or suggest that *at least two different ones of the leaf nodes of the forwarding tree contain indirect next hop data that references a same next hop within the next hop data.*

The cited references, either singularly or in combination, fail to establish a prima facie case for non-patentability of Applicant's claims under 35 U.S.C. 102 or 103(a). Applicant reserves further comment at this time with regard to the dependent claims, and Applicant does not acquiesce to any of the Examiner's interpretations of the Aramaki reference nor the propriety of any of the current rejections.

Claim Rejection Under 35 U.S.C. § 101

In the Final Office Action, the Examiner rejected claims 12-16 under 35 U.S.C. 101 because the claimed invention is not supported by either a specific asserted utility or a well established utility. Applicant has amended claim 12 to recite elements that defines structural and functional interrelationships which permit the data structure's functionality to be realized. For example, claim 12 as amended requires that the indirect next hop data causes the network device to, upon reaching a leaf node of a traversed path through the forwarding tree, select a next hop from the next hop data external to the forwarding tree and forward the packet to the selected next hop.

In the Examination Guidelines for Computer-Related Inventions, the U.S. Patent Office has specifically addressed both: (1) a computer-readable media encoded with computer instructions, and (2) a computer-readable medium encoded with data structures. With respect to the latter, the Office states:

> *Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are neither physical "things" nor statutory processes. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the medium which permit the data structure's functionality to be realized, and is thus statutory (emphasis added).*[2]

The Office's analysis is primarily based on cases in which the Court of Appeals for the Federal Circuit (CAFC) has specifically considered claims to a computer-readable medium storing unique data structures. In particular, in *In re Lowry,* the CAFC expressly stated that data structures on a medium are specific electrical or magnetic structural elements. In the *In re Lowry* decision, the court noted that the data structures are physical entities that provide increased efficiency in computer operation, and enable more efficient data processing operations on stored

[2] Examination Guidelines for Computer-Related Inventions Final Version, § B(1)(a), pg. 9.

data. The court concluded, therefore, that the data structures indeed "perform a function" and constitute patentable subject matter under 35 U.S.C. § 101. Consequently, the Lowry data structures indeed provide a useful, concrete and tangible result.

Applicant submits that claims 12-16 are directed to a computer-readable medium in which the interrelation between the data stored by the data structures as enables operation of a network router as claimed. As a result, the data structures of Applicant's claims provide a useful, concrete and tangible result. As expressly stated by the court in the *In re Lowry* decision, and as recognized by the Office's guidelines and the Examiner, such claims are directed to patentable subject matter under § 101. Applicant requests withdrawal of the rejection of claims 12-16 under 35 U.S.C. § 101.

Applicant notes, again, that independent claim 12 was not rejected under either 35 U.S.C. § 102 or 35 U.S.C. § 103.

CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims. Please charge any additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

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By: Kent J. Sieffert

SHUMAKER & SIEFFERT, P.A.
8425 Seasons Parkway, Suite 105
St. Paul, Minnesota 55125
Telephone: 651.735.1100
Facsimile: 651.735.1102

Name: Kent J. Sieffert
Reg. No.: 41,312